What is claimed is:

1. An immersion nozzle for continuous casting of steel, having an inner hole provided with a swirl vane for generating a swirling flow in molten steel passing therethrough, said inner hole having a wall surface adapted to come into contact with the molten steel during use, at least a part of wall surface being formed of a refractory layer containing CaO and MgO, said refractory layer being prepared by controlling a weight ratio of each of CaO and MgO in said refractory layer, and an apparent porosity.

2. The immersion nozzle as defined in claim 1, wherein said CaO-MgO-containing refractory layer contains a carbonaceous material, wherein a sum of respective weight ratios of MgO and CaO in said refractory layer is 65 mass % or more, and a weight ratio of CaO / MgO is in the range of 0.4 to 2.3.

3. The immersion nozzle as defined in claim 2, wherein said CaO-MgO-containing refractory layer is formed as a tubular-shaped refractory layer having an apparent porosity of 5 to 25 % and a thickness of 3 to 20 mm.

4. The immersion nozzle as defined in claim 2 or 3, wherein said carbonaceous material is contained in said CaO-MgO-containing refractory layer in the range of 1 to 35 mass %.

5. The immersion nozzle as defined in claim 2 or 4, wherein said CaO-MgO-containing refractory layer contains 5 mass % or less of B_4C, SiC, Al and Si, etc.

6. The immersion nozzle as defined in claim 1, wherein said swirl vane is prepared by twisting a tape-shaped refractory material at an angle of 80 to 180 degrees on the basis of a horizontal plane, in such a manner as to be formed in a spiral shape.

7. The immersion nozzle as defined in claim 1 or 6, wherein the wall surface of said inner hole

is partially formed with a tier or convex portion, and said swirl vane is fixed to said tier or convex portion.

8. The immersion nozzle as defined in claim 7, which has a gas injection port located on an upstream side relative to said swirl vane.

9. The immersion nozzle as defined in claim 7 or 8, wherein said CaO-MgO-containing refractory layer is formed to serve as the entire wall surface of said inner hole including a portion of said wall surface on a downstream side relative to said swirl vane.

10. The immersion nozzle as defined in claim 7 or 9, wherein said swirl vane is disposed in said inner hole on an upstream side relative to a position corresponding to a powder line.

11. The immersion nozzle as defined in either one of claims 8 to 10, wherein said immersion nozzle is designed such that gas inert relative to steel is supplied into molten steel passing through said inner hole, from a gas injection port disposed on an upstream side relative to said swirl vane, through a space formed on the side of a back surface of said tubular-shaped refractory layer from a gas feed port.

12. A method for continuous casting of steel, using a continuous casting nozzle having an inner hole which is provided with a swirl vane for generating a swirling flow in molten steel passing therethrough, and defined by a wall surface adapted to come into contact with the molten steel during use, at least a part of said wall surface being formed of a tubular-shaped refractory layer, wherein:

said steel is clean steel; and

said refractory layer contains a carbonaceous material, MgO and CaO, wherein a total amount of MgO and CaO is 65 mass % or more, and a weight ratio of CaO / MgO is in the range of 0.4 to 2.3, said refractory layer having an apparent porosity of 5 to 25 %.

13. The method as defined in claim 12, which including injecting inert gas into molten steel passing through said inner hole, from a gas injection port which is formed in said continuous casting nozzle including an upper nozzle associated with a molten steel vessel, at a position on an upstream side relative to said swirl vane.